

## ABSTRACT OF THE DISCLOSURE

A semiconductor device structure having a barrier layer comprising a conductive portion and a nonconductive portion is disclosed. The conductive portion includes a metal nitride compound and the nonconductive portion includes a metal oxide, metal oxynitride, metal carbide, or metal carbonitride compound. A method of forming the semiconductor device structure is also disclosed. The method comprises forming a barrier layer over a metallization layer and a dielectric layer in the semiconductor device structure. The barrier layer is formed by depositing a thin, metal layer over the metallization layer and the dielectric layer. The metal layer is exposed to a nitrogen atmosphere and the nitrogen reacts with portions of the metal layer over the metallization layer to form a conductive, metal nitride portion of the barrier layer. Portions of the metal layer over the dielectric layer react with carbon or oxygen in the dielectric layer to produce a nonconductive portion of the barrier layer.